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13DV-13349  
PATENT

3746



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Hook et al.

Serial No.: 09/545,554

Filed: April 7, 2000

For: METHODS AND APPARATUS  
FOR REDUCING GAS  
TURBINE ENGINE EMISSIONS

Art Unit: 3746

Examiner: Kim, T.

Reply  
#21 Brief  
11/20/02  
Brewer

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REPLY BRIEF

Commissioner for Patents  
Washington, D.C. 20231

Sir:

The Examiner's Answer dated September 9, 2002, has been carefully reviewed, and the following remarks have been made in consequence thereof, and in addition to the remarks submitted within Applicants' Appeal Brief dated July 22, 2002.

REMARKS

The apparatus recited in Claims 1-4, 6, 8-11, and 15-17 is submitted as nonobvious over Schilling et al. (U.S. Patent No. 5,630,319) in view of either Horner et al. (U.S. Patent No. 5,274,995) or Borkowicz et al. (U.S. Patent No. 5,259,184), and further in view of Joshi et al. (U.S. Patent No. 5,351,184).

Independent Claims 1, 6, and 14 each include, in pertinent part, recitations directed to a gas turbine engine that includes a lean premix combustor configured to operate with a fuel/air

mixture equivalence ratio less than one, and a water delivery sub-system that is connected to the engine for supplying at least one of steam and water to the engine.

Applicants respectfully submit that none of the prior art, considered alone or in combination, describes or suggests the claimed invention. Specifically, Applicants submit that none of the prior art, considered alone or in combination, describes or suggests a combustor that is operable with a fuel/air ratio less than one, while at least one of water and steam is injected into the engine. More specifically, in contrast to the present invention, Schilling through incorporation of Joshi et al., describes a dry low combustor that is operable with a fuel/air ratio less than one, but does not describe nor suggest a combustor that is operable with water injection. In fact, at column 1, lines 27-31, Joshi et al. recite that although "the wet techniques (water/steam injection) and selective catalytic reduction have proven themselves in the field, both of these techniques require extensive use of ancillary equipment...[o]bviously this drives the cost of energy production higher." Accordingly, both Joshi et al. and Schilling describe only the use of a dry combustor.

Moreover, in contrast to Schilling and Joshi et al., both Horner et al. and Borkowicz et al. describe combustors that are operable with optional water injection, (see Horner et al. at

column 2, lines 17-21, and Borkowicz et al. at column 2, lines 21-22 for a description of optional water injection), but neither Horner et al. nor Borkowicz et al. describe or suggest a combustor that is operable with a fuel/air ratio less than one.

Accordingly, although water injection equipment may have been conventionally used in the prior art, Applicants respectfully submit in contrast to the Examiner's Response, that water injection equipment has not been conventionally used in the prior art in combustors operable with fuel/air ratios less than one, as is recited in the pending claims. Furthermore, as recited in the background of the present application, Applicants respectfully submit making modifications to a gas turbine engine in an effort to reduce nitrous oxide emissions often has an adverse effect on operating performance levels of the associated gas turbine engine. As such, and in contrast to the Examiner's Answer, Applicants respectfully submit that no motivation exists, nor was there any likelihood of success prior to the pending application, for the cited combination.

Accordingly, Applicants respectfully request the Section 103 rejection of Claims 1-4, 6, 8-11, and 15-17 should be withdrawn.

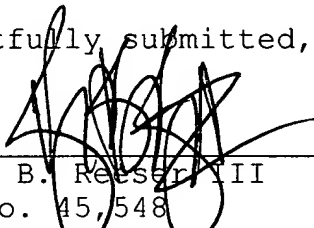
The apparatus recited in Claims 5, 12-14, and 18-20, is submitted as nonobvious over Schilling et al. in view of Horner et al. or Borkowicz et al., and further in view of Talabisco et al., or Maslak, and Joshi et al.

In addition to the comments recited above, Applicants respectfully submit that with respect to the addition of the Talabisco et al. or Maslak references, although both Talabisco et al. and Maslak describe controlling an amount of steam to be injected based on a plurality of engine operating parameters, Applicants respectfully submit that neither Talabisco et al. nor Maslak, nor any combination of the cited art, describe or suggest controlling an engine including a combustor that is operable with water injection and a fuel/air ratio less than one.

Accordingly, Applicants respectfully submit that the Section 103 rejection of Claims 5, 12-14, and 18-20 should be withdrawn.

As all the pending Claims are believed to be patentable over the cited art and in condition for allowance, favorable action is respectfully solicited.

Respectfully submitted,



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